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## Case Report

## Successful implantable cardioverter-defibrillator implantation through a communicating branch of the persistent left superior vena cava



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## ABSTRACT

A left pectoral dual chamber implantable cardioverter-defibrillator (ICD) was successfully implanted through a small branch communicating between a persistent left superior vena cava (PLSVC) and right-sided venous drainage with long sheaths. Postprocedural computed tomography identified the communicating branch. ICD lead implantation through a PLSVC is challenging and sometimes unsuccessful. This case illustrates an alternative approach for ICD lead implantation in patients with a PLSVC. A PLSVC system should be carefully inspected for any communicating branches that can be utilized for lead implantation in order to increase the chance of success and minimize the risk of complications.

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## 1. Introduction

Persistent left superior vena cava (PLSVC) is often encountered in the electrophysiology laboratory and can be accompanied by other venous anomalies [1]. Implantation of transvenous pacemaker or implantable cardioverter-defibrillator (ICD) leads through the PLSVC is challenging, with prolonged procedural times. ICD lead placement with a defibrillation coil through the PLSVC may be difficult because it often requires looping the lead in the right atrium (RA) for the lead to cross the tricuspid valve [2]. This can increase the mechanical stress on the lead, making it prone to future complications. We describe a patient with a PLSVC who underwent a successful left pectoral implantation of an ICD lead through an alternative approach.

## 2. Case

A 52-year-old woman with a history of congestive heart failure secondary to non-ischemic cardiomyopathy and sinus bradycardia underwent a left pectoral implantation of a dual-chamber ICD for primary prophylaxis. She had no history of congenital anomalies. A cephalic venous access was obtained via the standard approach. When a guidewire was advanced through the cephalic vein, a possible PLSVC was observed (Fig. 1A). Venography confirmed the PLSVC and revealed a small branch that allowed the PLSVC to communicate with the right-

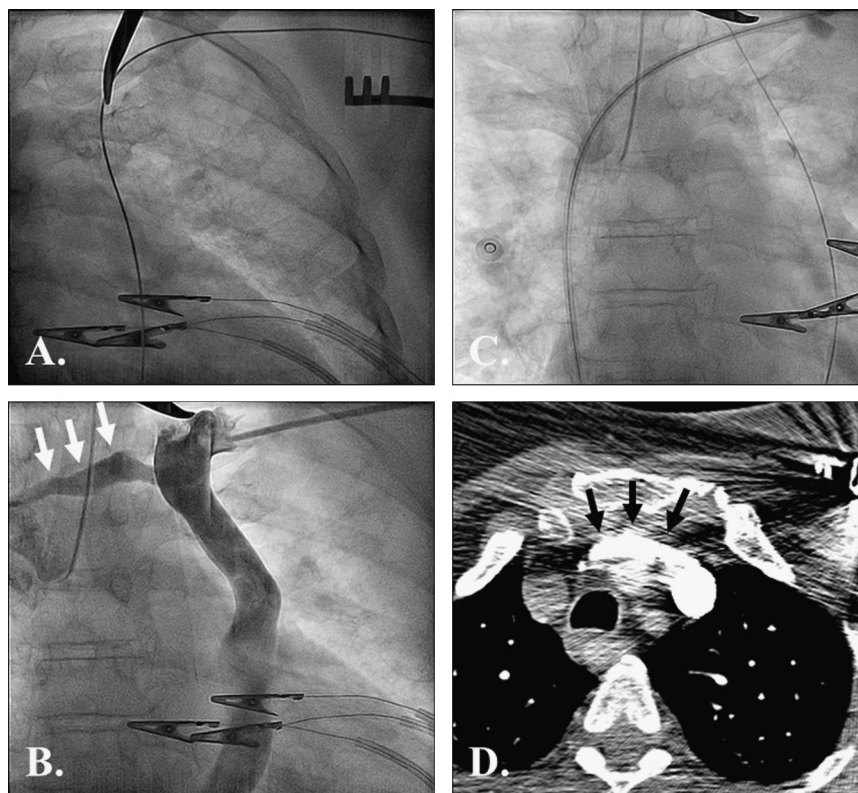
sided venous drainage (Fig. 1B). A 0.035-in hydrophilic-coated guidewire was introduced through the cephalic vein and carefully manipulated through the communicating branch into the RA and back up to the PLSVC (Fig. 1C), providing good support for introducing a 7-Fr-long sheath into the RA over the guidewire. Another guidewire was introduced into the RA through the long sheath and was used to advance the second long sheath. Atrial (2088TC-46, St. Jude Medical, Saint Paul, MN, USA) and ICD leads (7122Q-58, St. Jude Medical) were successfully placed through the communicating branch in the RA appendage and right ventricular apex, respectively (Fig. 2). An ICD pulse generator (St. Jude Medical CD2357-40Q) was placed in the left subcutaneous pocket. Defibrillation threshold testing was performed with successful defibrillation with 15-J biphasic shock. On postprocedural enhanced computed tomography, other congenital anomalies were ruled out, and the PLSVC and its communicating branch with a right-sided venous system were clearly identified (Fig. 1D). No complications occurred.

## 3. Discussion

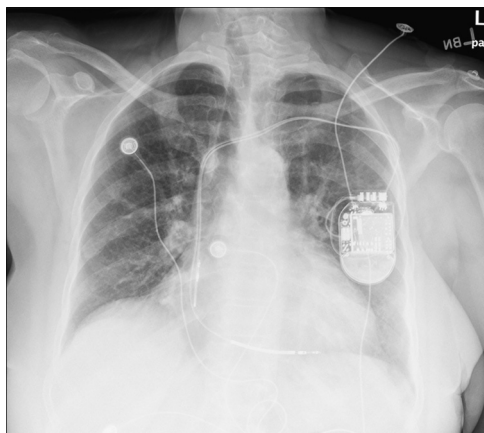
PLSVC can be encountered for the first time during electrophysiological procedures. It is the most common variation in the thoracic venous system and is estimated to be present in 0.3–0.5% of the general population and in 5–10% of patients with other congenital heart defects [3]. It can be accompanied by other congenital venous anomalies [3]. Several PLSVC subtypes are recognized. About 20% of patients do not have a right superior vena cava (RSVC), which results in venous blood drainage from the head and both arms through the left brachiocephalic vein, PLSVC, and coronary sinus into the RA.

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**Fig. 1.** (A) Fluoroscopic image showing the guidewire introduced through the left cephalic vein into the persistent left superior vena cava (PLSVC). (B) Venogram showing the PLSVC with a communicating branch (white arrows). (C) Fluoroscopic image exhibiting the guidewire introduced through the communicating venous branch back up into the PLSVC. (D) Postprocedural enhanced computed tomographic image showing the PLSVC with a communicating branch (black arrows).



**Fig. 2.** Postprocedural chest radiogram exhibiting the defibrillator system placed in a common site.

However, most patients have an RSVC. In 60% of cases, the PLSVC and RSVC are connected by a communicating branch (left brachiocephalic vein) [3]. Therefore, approximately 50% of PLSVC cases have a venous branch communicating between the PLSVC and RSVC.

ICD lead implantation through a PLSVC is often challenging and sometimes unsuccessful [4]. It can prolong fluoroscopic and procedural times, and the loop on the lead across the tricuspid valve can result in higher mechanical stress, making it prone to lead failure. This

case illustrates an alternative approach for ICD lead implantation in a patient with a PLSVC. Our findings suggest that a PLSVC system should be carefully inspected for any communicating branches that can be utilized for lead implantation in order to increase the chance of success and minimize the risk of complications. The above-mentioned anatomical findings may also encourage this strategy.

#### Conflict of interest

No financial support was received for this study.

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